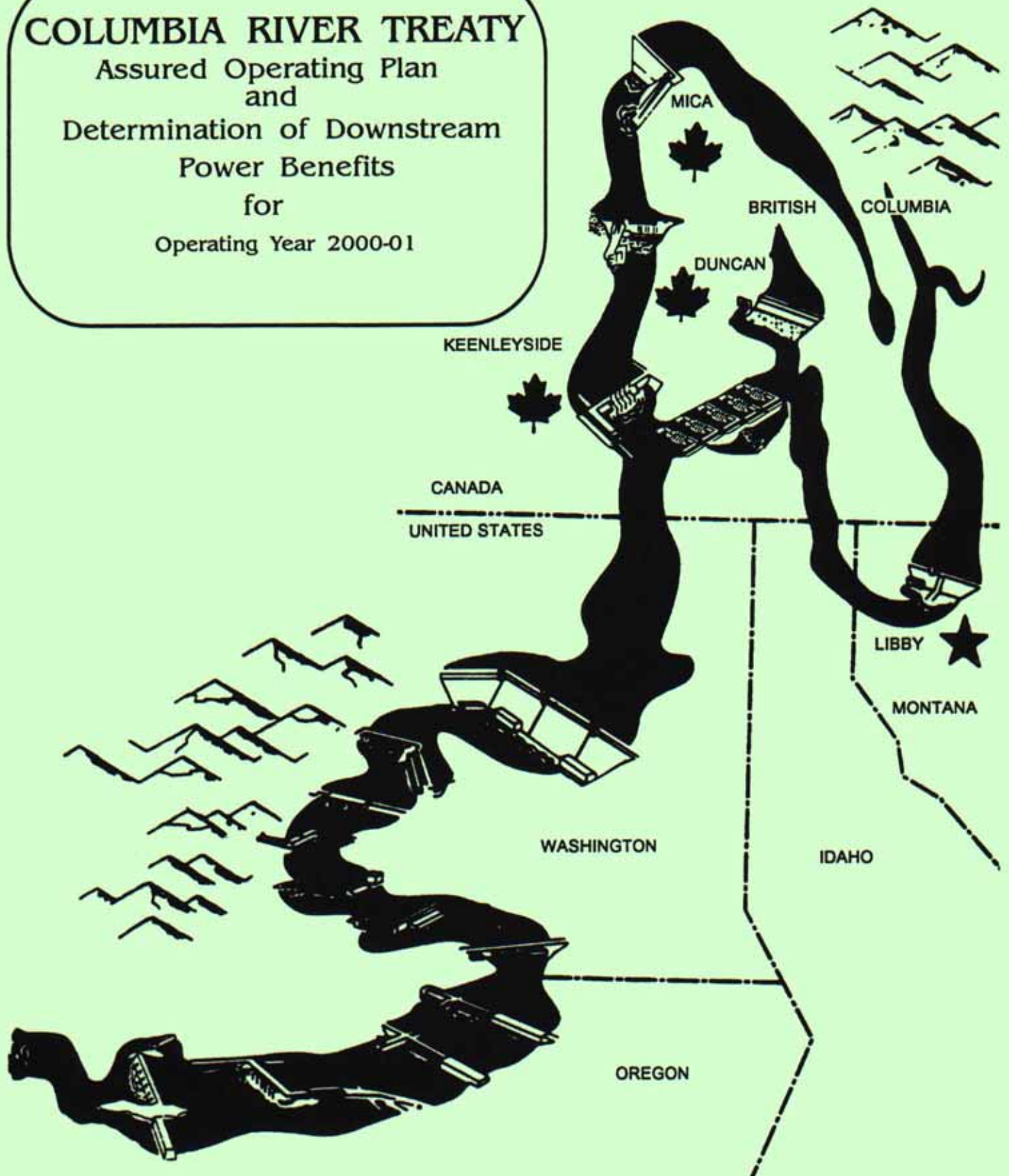


COLUMBIA RIVER TREATY

Assured Operating Plan
and
Determination of Downstream
Power Benefits
for
Operating Year 2000-01



**COLUMBIA RIVER TREATY ENTITY AGREEMENT ON THE
ASSURED OPERATING PLAN AND
DETERMINATION OF DOWNSTREAM POWER BENEFITS
FOR THE 2000-01 OPERATING YEAR**

The Columbia River Treaty between Canada and the United States of America requires that the Entities agree annually on an assured plan of operation for Canadian Treaty storage and on the resulting downstream power benefits six years in advance.

The Entities agree that the attached reports entitled "Columbia River Treaty Assured Operating Plan for Operating Year 2000-01" and "Determination of Downstream Power Benefits for the Assured Operating Plan for Operating Year 2000-01," both dated January 2000, shall be the Assured Operating Plan and Determination of Downstream Power Benefits for the Operating Year 2000-01.

In order to complete studies associated with the 2000-01 Assured Operating Plan and Determination of Downstream Power benefits so that this Agreement could be concluded, the Entities executed on 30 January 1995 an agreement called "Columbia River Treaty Entity Agreement on the Preparation of the 1998-99, 1999-00, 2000-01 Assured Operating Plan and Determination of Downstream Power Benefits Studies" which provided for certain agreed procedures to be used in studies preparatory to this Agreement.


In witness thereof, the Entities have caused this Agreement to be executed.

Executed for the Canadian Entity this 16th day of FEBRUARY 2000.

By 
Brian R.D. Smith, Chair

Executed for the United States Entity this 16th day of FEBRUARY 2000.

By 
Judith A. Johansen, Chairman

By 
Brigadier General Carl A. Strock, Member

**COLUMBIA RIVER TREATY
HYDROELECTRIC OPERATING PLAN**

**ASSURED OPERATING PLAN
FOR OPERATING YEAR 2000-01**

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HYDROELECTRIC OPERATING PLAN ASSURED OPERATING PLAN FOR OPERATING YEAR 2000-01

January 2000

1. Introduction

The treaty between Canada and the United States of America relating to the cooperative development of the water resources of the Columbia River Basin (Treaty) requires that each year an Assured Operating Plan (AOP) be agreed to by the Entities for the operation of the Columbia River Treaty storage in Canada during the sixth succeeding year. This plan will provide to the Entities information for the sixth succeeding year for planning the power systems in their respective countries which are dependent on or coordinated with the operation of the Canadian storage projects.

This AOP was prepared in accordance with the Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans¹ (POP) and in accordance with the following Entity Agreements:

- Principles² and on Changes to Procedures³ for the Preparation of the Assured Operating Plan and Determination of Downstream Power Benefit Studies, signed 28 July and 12 August 1988, respectively,
- The "Columbia River Treaty Entity Agreement on the 1998/99, 1999/2000, and 2000/2001 Assured Operating Plan and Determination of Downstream Power Benefit Studies," dated 5 April 1995.⁴

POP is based on criteria contained in Annex A and Annex B of the Columbia River Treaty,⁵ the Protocol,⁶ the Terms of Sale,⁷ and the Columbia River Treaty Flood Control Operating Plan.⁸

In accordance with the Protocol VII (2), this AOP provides a reservoir-balance relationship for each month for the whole of the Canadian storage. This relationship is determined from the following:

- (a) The Critical Rule Curve (CRC) for each project, the individual project Upper Rule Curves (URC), and the related rule curves and data used to compute the individual Operating Rule Curves (ORC).
- (b) Operating Rules that specifically designate criteria for operation of the Canadian storage in accordance with the principles contained in the above references.
- (c) The supporting data and model used to simulate the 30-year operation for the Step I Joint Optimum hydroregulation study.⁹

This is the first AOP to include both English and metric units.¹⁰ For operational purposes, the English units should be used as having a degree of accuracy consistent with previous year's studies. Calculations based on metric units are approximations derived by rounding conversions from English units. Metric values are displayed with either one or two decimal places to assure consistency with English units and do not imply that level of precision. The inclusion of metric units complies with U.S. Federal statutory requirements. Tables referred to in the text are in English units. Metric tables use the same numbering system with the letter "M" after the table number.

2. System Regulation Studies

In accordance with Annex A, paragraph 7, of the Treaty, the Columbia River Treaty Operating Committee conducted system regulation studies reflecting Canadian storage operation for optimum generation in both Canada and the United States. Downstream power benefits were computed with the Canadian storage operation based on the operating rules specified herein.

System Regulation Studies for the AOP were based on 2000-01 estimated loads and resources in the United States Pacific Northwest System and hydro resources in the Columbia River Basin in British Columbia. In accordance with the Protocol VIII, the 2000-01 AOP is based on a 30-year streamflow period and the Entities have agreed to use an operating year of 1 August to 31 July. Historical flows for the period August 1928 through July 1958, modified by estimated irrigation depletions for the 1990 level and including the latest Grand Coulee pumping, were used.¹¹ The 1990 level is considered the best estimate of irrigation depletions for the 2000-01 operating year.

The CRC's were determined from a critical period study of optimum power generation in both Canada and the United States. The study indicated a 42-month critical period for the United States system resulting from the low flows during the period from 1 September 1928 through 29 February 1932. With the exceptions of Brownlee, Dworshak, and John Day, it was assumed that all reservoirs, both in the United States and Canada, were full at the beginning of the critical period except where minimum release requirements made this impossible.

In the studies, individual project flood control criteria were followed. Flood Control and Variable Refill Criteria are based on historical inflow volumes. Although only 15.5 million acre-feet (Maf) (19.12 cubic kilometers (km³)) of usable storage is committed for power operation purposes under the Treaty, the Columbia River Treaty Flood Control Operating Plan provides for the full draft of the total 20.5 Maf (25.29 km³) of usable storage for on-call flood control purposes.

3. Development of the Assured Operating Plan

This AOP was developed in accordance with Annex A, paragraph 7 of the Treaty and was designed to produce optimum power generation at-site in Canada and downstream in Canada and the United States. The Mica Operating criteria specified in Table 1 were evaluated using the two tests described below.

(a) Determination of Optimum Generation in Canada and the United States

To determine whether optimum generation in both Canada and the United States was achieved in the system regulation studies, the firm energy capability, dependable peaking capability, and average annual usable secondary energy were computed for both the Canadian and United States systems.

In the studies for the 2000-01 AOP, the Canadian storage operation was operated to achieve a weighted sum of the three quantities that was greater than the weighted sum achieved under an operation of Canadian storage for optimum generation in the United States of America alone.

In order to achieve a weighted value for the three quantities, the Columbia River Treaty Operating Committee agreed for the 2000-01 AOP that the three quantities would be assigned the following relative values:

<u>Quantity</u>	<u>Relative Value</u>
Firm energy capability (aMW)	3
Dependable peaking capability (MW)	1
Average annual usable secondary energy (aMW)	2

After weighting each quantity, the three quantities were added, resulting in a net gain to the combined Canadian and United States systems in the study designed for optimum generation in Canada and the United States.

Table 2 shows the results from studies adopted for the 2000-01 AOP and from studies designed to achieve optimum generation in the United States alone.

(b) Maximum Permitted Reduction in Downstream Power Benefits

Separate Step II system regulation studies were developed reflecting (i) Canadian storage operation for optimum generation in both Canada and the United States, using the Mica Project operating criteria described in section 5(c) below, and (ii) Canadian storage operation for optimum generation in the United States alone. Using these Mica Project operating criteria, there is a 0.7 aMW increase in the Canadian Entitlement for average annual usable energy and no change in the dependable capacity compared to an operation for optimum generation in the United States alone.

Since there is no reduction in entitlement, the Entities have determined that these changes are within the maximum permitted reduction in downstream power benefits specified by the Treaty.

4. Rule Curves

The operation of Canadian storage during the 2000-01 Operating Year shall be guided by an ORC for the whole of Canadian storage, Flood Control Storage Reservation Curves for the individual projects, CRC's, and operating rules for specific projects. The ORC is derived from the various curves described below. These ORC's are first determined for the individual Canadian projects and then summed to yield the Composite ORC for the whole of Canadian storage, in accordance with paragraph VII(2) of the Protocol.

(a) Critical Rule Curve

The CRC indicates the end-of-period storage content of Canadian storage during the critical period. It is designed to protect the ability of the United States system to serve firm load with the occurrence of flows during the most adverse historical streamflow period. A tabulation of the CRC's for Duncan, Arrow, Mica, and the Composite CRC's for the whole of Canadian storage is included as Table 3.

(b) Refill Curves

The Refill Curves are used to develop the ORC's. The end of the refill period is considered to be 31 July. There are two types of refill curves, the Assured Refill Curve (ARC) and the Variable Refill Curve (VRC), which are discussed in the following sections. In each case, adjustment is made for water required for refill of upstream reservoirs when applicable. Tabulations of the VRC's and outflow schedules used in determining the VRC's and ARC's for Mica, Arrow, and Duncan are provided in Tables 4-6, respectively.

(1) Assured Refill Curve

The ARC indicates the end-of-period storage content required to assure refill of Canadian storage based on the 1930-31 water year, which is the system's second lowest historical January through July volume of inflow at The Dalles, Oregon during the 30-year record. A tabulation of the ARC's for Mica, Arrow, and Duncan are included in Tables 4-6. The outflows, or Power Discharge Requirements (PDR's), used in developing these ARC's are also shown in these tables.

(2) Variable Refill Curve

The VRC is provided as a check to ensure that the ARC is not too conservative. The VRC's give end-of-period storage contents for the period January through July required to refill Canadian storage during the refill period. They were based

on historical inflow volumes, upstream storage requirements, and PDR's determined in accordance with the POP. In the system regulation studies, the PDR's were made a function of the unregulated January through July runoff volume at The Dalles, Oregon. The PDR's used in computing the VRCs were interpolated linearly between the values shown in Tables 4-6. In those years when the January to July runoff volume at The Dalles was less than 80 Maf (98.68 km³) or greater than 110 Maf (135.69 km³), the discharge used was that specified for 80 and 110 Maf (98.68 km³ and 135.69 km³), respectively.

VRC's for Mica, Arrow and Duncan for the 30 years of historical record in Tables 4-6 illustrate the probable range of these curves based on historical conditions. In actual operation in 2000-01, the PDR's will be based on the forecast of unregulated runoff at The Dalles.

(c) Limiting Rule Curve (LRC) or Energy Content Curve Lower Limit (ECCLL)

The LRC's indicate 31 January through 15 April end-of-period storage contents. These contents must be maintained to protect the ability of the system to meet firm load during the period January through 30 April in the event that the VRC's permit storage to be emptied and sufficient natural flow is not available to carry the load prior to the start of the freshet. Such rule curves shall limit the VRC to be no lower than the LRC's. The LRC is developed for 1936-37 water conditions. The LRC's for Mica, Arrow, and Duncan are shown in Tables 4-6, respectively.

(d) Upper Rule Curve (Flood Control)

The URC's indicate the end-of-period storage content to which each individual Canadian storage project shall be evacuated for flood control. The URC's used in the studies were based upon Flood Control Storage Reservation Diagrams contained in the Columbia River Treaty Flood Control Operating Plan¹² and analysis of system flood control simulations.¹³ URC's for Mica, Arrow, and Duncan for the 30-year study period are shown on Tables 7-9, respectively. Tables 7 and 8 reflect an agreed transfer of flood control space in Mica and Arrow to maximum drafts of 2.08 Maf and 5.1 Maf (2.57 km³ and 6.29 km³) respectively. In actual operation, the URC's will be computed as outlined in the Flood Control Operating Plan, using the latest forecast of runoff available at that time.

(e) Operating Rule Curve

The ORC's define the normal limit of storage draft to produce secondary energy and provide a high probability of refilling the reservoirs. In general, the Operating Plan does not permit serving secondary loads at the risk of failing to refill storage and thereby jeopardizing the firm load carrying capability of the United States or Canadian systems during subsequent years.

During the period 1 August through 31 December, the ORC is defined as the CRC for the first year of the critical period or the ARC, whichever is higher. During the period 1 January through 31 July, the ORC is defined as the higher of the CRC and the ARC; unless the VRC is lower, then it defines the ORC. During the period 1 January through 15 April, the ORC will not be lower than the LRC. The ORC shall be less than or equal to the URC. The composite ORC for the whole of Canadian storage for 30 years of historical record are included in Table 10 to illustrate the probable future range of these curves based on historical conditions. The lower of the Energy Content Curves for United States reservoirs, or the URC's, are equivalent to ORC's.

5. Operating Rules

A 30-year System Regulation Study¹⁴ was utilized to develop and test the operating rules and rule curves. It contains the agreed-upon operating and CRC's; and operating rules and constraints, such as maximum and minimum project elevations, discharges, draft rates, etc. These constraints are included as part of this operating plan, as found in Appendix A1 (English units) or Appendix A2 (Metric units).

The following rules, used in the 30-year System Regulation Study, will apply to the operation of Canadian storage in the 2000-01 Operating Year.

(a) Operation Above ORC

The whole of the Canadian storage will be drafted to its ORC as required to produce optimum generation in Canada and the United States in accordance with Annex A, paragraph 7, of the Treaty, subject to project physical characteristics, operating constraints, and the criteria for the Mica project listed in section 5(c).

(b) Operation Below ORC

The whole of Canadian storage will be drafted below its ORC as required to produce optimum generation to the extent that a System Regulation Study determines that proportional draft below the ORC is required to produce the hydro firm energy load carrying capability (FELCC) of the United States system. FELCC is determined by the applicable Critical Period Regulation study. Proportional draft between rule curves will be determined as described in the POP.

Mica Reservoir will, however, continue to be operated in accordance with section 5(c) below, so as to optimize generation at site and at Revelstoke as well as downstream in the United States. In the event the Mica operation results in more or less than the project's proportional share of draft from the whole of Canadian storage, compensating changes will be made from Arrow to the extent possible.

(c) Mica Project Operation

Mica project operation will be determined by Arrow's storage content at the end of the previous period as shown in Table 1. Mica outflows will be increased above the values shown in the table in the periods from October through June if required to avoid storage above the URC.

Under this AOP, Mica storage releases in excess of 7.0 Maf (8.63 km³) that are required to maintain the Mica outflows specified under this plan will be retained in the Arrow reservoir, subject to flood control and other project operating criteria at Arrow. The total combined storage draft from Mica and Arrow will not exceed 14.1 Maf (17.39 km³), unless flood control criteria will not permit the additional Mica storage releases to be retained at Arrow. Should storage releases in excess of 14.1 Maf (17.39 km³) be made, the target Mica operation will remain as specified in Table 1.

Revelstoke, Upper Bonnington, Lower Bonnington, South Slocan, Brilliant, Seven Mile, and Waneta have been included in the 2000-01 AOP and have been operated as run-of-river projects. Generation at Arrow was modeled in the studies. Corra Linn and Kootenay Canal were included in the study and operated in accordance with criteria that closely approximates International Joint Commission rules for Kootenay Lake.

6. Implementation

The Entities have agreed that each year a Detailed Operating Plan (DOP) will be prepared for the immediately succeeding operating year. Such DOP's are made under authority of Article XIV 2.(k) of the Columbia River Treaty, which states:

"...the powers and the duties of the entities include:

- (k) preparation and implementation of detailed operating plans that may produce results more advantageous to both countries than those that would arise from operation under the plans referred to in Annexes A and B."

The 2000-01 DOP will reflect the latest available load, resource, and other pertinent data to the extent the Entities agree these data should be included in the plan.

The data and criteria contained herein may be reviewed, and updated as agreed by the Entities, to form the basis for a 2000-01 DOP. Failing agreement on updating the data and/or criteria, the 2000-01 DOP will include the rule curves, Mica operating criteria, and other data and criteria provided in this AOP. Actual operation during the 2000-01 Operating Year shall be guided by the DOP.

The values used in the AOP studies to define the various rule curves were period-end values only. In actual operation, it is necessary to operate in such a manner during the course of each period that these period-end values can be achieved in accordance with the operating

rules. Due to the normal variation of power load and streamflow during any period, straight-line interpolation between the period-end points should not be assumed.

During the storage drawdown season, Canadian storage should not be drafted below its period-end point at any time during the period unless it can be conservatively demonstrated that sufficient inflow is available, in excess of the minimum outflow required to serve power demand, to refill the reservoir to its end-of-period value as required. During the storage evacuation and refill season, operation will be consistent with the Flood Control Operating Plan. When refill of Canadian storage is being guided by Flood Control Refill Curves, such curves will be computed on a day-by-day basis using the residual volume-of-inflow forecasts depleted by the volume required for minimum outflow, unless higher flows are required to meet firm load, from each day through the end of the refill season.¹⁵

7. Canadian Entitlement

On 1 April 1998 and on 1 April 1999, the portions of the Canadian Entitlement to downstream power benefits attributed to the operation of Duncan and Arrow dams, respectively, cease to be covered by the Terms of the Sale of the Canadian Entitlement in the United States of America authorized by an Exchange of Notes between Canada and the United States of America dated 16 September 1964.¹⁶ This AOP has been prepared on the basis that the portion of the Canadian Entitlement attributable to Duncan (i.e., 1.4 Maf / 15.5 Maf) [1.72 km³/19.12 km³] will be returned to Canada starting 1 April 1998, and the portion attributable to Arrow (i.e., 7.1 Maf/15.5 Maf) [8.76 km³ / 19.12 km³] will be returned starting 1 April 1999.

(a) Delivery of the Canadian Entitlement

The Treaty specifies return of the Canadian Entitlement at a point near Oliver, British Columbia, unless otherwise agreed by the Entities. Because no cross border transmission exists at any point on the Canada-United States of America boundary near Oliver, the Entities completed an agreement on Aspects of the Canadian Entitlement Return for 1 April 1998 through 31 March 2003,¹⁷ executed 28 July 1992. This agreement has now been replaced by the Columbia River Treaty Entity Agreement on Aspects of the Delivery of the Canadian Entitlement for 1 April 1998 through 15 September 2024, dated 29 March 1999.¹⁸ This arrangement covers the full 1 August 2000 through 31 July 2001 period covered by this AOP.

(b) Capacity/Energy Entitlement Scheduling Guidelines

The Columbia River Treaty Entity Agreement on Aspects of the Delivery of the Canadian Entitlement Return for 1 April 1998 through 15 September 2024,¹⁹ specifies the scheduling guidelines for delivery of the Canadian Entitlement.

8. Summary of Changes from Previous Year

Data from the five most recent AOP's are summarized in Table 11. Firm energy shifting was not included in these studies. Some changes to the format of Table 11 for this year were: the hydro firm load for each period was listed instead of the secondary load; the Canadian Treaty CRC1 for different periods were in storage content instead of draft content; and the 50-yr average Canadian Treaty storage for these periods were added for information. An explanation of the more important changes compared to last year's studies follows.

(a) Loads and Non-Hydro Resources

Loads for the 2000-01 AOP were based on the 1994 Whitebook medium case forecast developed by BPA in September 1994. The Pacific Northwest Area (PNWA) firm energy load increased by 290 aMW. Loads increased in every period with the exception of January, which decreased by 69 aMW. The total exports, not including firm surplus energy, decreased by 136 aMW. The decrease in exports is mainly due to the decreased Canadian Entitlement Return. It was assumed that 1/3 of the Entitlement Return was to remain in the PNWA. The surplus firm energy increased by 32 aMW with shaping of 471 aMW 1 August through 30 April, and 1537 aMW in May through July.

The total annual energy capability of the thermal installations increased by 500 aMW. Major thermal resource changes included:

- Decrease of 10 aMW due to the termination of two Small Thermal projects: EWEB's Willamette Steam Plant and Puget's Shuffleton,
- Combustion Turbine resource increases of 285 aMW due to the addition of Clark's new Cogentrix and WWP's Rathdrum now reporting energy,
- Co-generation increased 99 aMW due to an increase in PP&L miscellaneous cogeneration and facilities upgrade at PGE's Coyote Springs,
- Centralia large thermal generation increased by 58 aMW,
- Thermal Non-Utility Generation (NUGs) decreased by 20 aMW mostly due to the termination of Idaho's NUG's,
- Imports increased by 87 aMW due to the addition of five new BPA imports and to the Glendale to PGE Seasonal Exchange. PG&E-to-WWP was the only import to terminate. Both the PP&L (WYM) to PP&L and Montana Thermal Import increased and showed different monthly shaping from the previous year's data.

(b) Operating Procedures

The 1990 level modified base flows were again used, with no additional depletion to the 2001 level, based on the recommendation of the Columbia River Water Management Group. Grand Coulee pumping adjustments and return flow, however, were included.

The Entities completed a Step I refill study and incorporated the resulting PDR's in the 2000-01 DDPB. New LRC's were developed for the Step I system based on 1937 water conditions. These studies are consistent with PNCA procedures, which includes starting the system full 1 August 1936 and adjusting the load until the system is empty 30 April 1937. The end of period contents in January, February, March, and 15 April are the LRC's for all major reservoir projects.

Plant data for Arrow, Ice Harbor, Lower Granite, Little Goose, Lower Monument, Dworshak, Rock Island, and Chief Joseph were revised. However, Arrow, and Rock Island were the only projects to show a significant change in generation. Arrow had generation for the first time, and the Rock Island generation decreased due to updated generation vs. discharge data.

Notable changes in non-power constraints include a revision of spill data, fisheries requirements, and the operation of Dworshak, John Day, and the non-base system Lower Snake projects. For further details, see Appendix A1 (English units) or Appendix A2 (Metric units).

The spill and bypass assumptions for the 2000-01 DDPB studies are different from the 1999-00 DDPB studies as follows:

- Fish bypass installations previously forecast to be installed at Bonneville, The Dalles, John Day, Ice Harbor, Wanapum, Rock Island, and Rocky Reach in the 1999-00 DDPB studies were removed from the hydroregulation model; and
- All proportional fish spill for the base system (% of fish spill) was removed. Most projects showed a decrease in generation. The only fish spill remaining was fixed fish spill at Wells and Rock Island. Ice Harbor and The Dalles had increased other spill. Priest Rapids was the only project to show increased generation since in the AOP00 the bypass was installed and fish spill was operative. Fixed fish spill remained at Wells and Rock Island. Only the non-sluceway component of other spill remained at Ice Harbor and The Dalles.

Dworshak began the Step I critical period 80 feet (24.38 meters (m)) below full, an additional 50 feet (15.24 m) lower than the previous year's study, and did not empty at the end of the critical period, remaining on URC. Other Dworshak requirements include: operate to minimum flow requirements or URC 15 August through 15 April, meet flows for fish through July, and draft to meet Lower Granite flows of 50000 cfs (1,415.84 m³/s) in August, when reservoir elevation is above 1520 ft (463.30 m) [(395.7 ksf), or (968.1 hm³)].

Other projects that showed a significant loss of generation were: John Day due to operation to a lower minimum operating pool, and Lower Granite, Little Goose, and Lower Monumental because of the inclusion of fish constraints.

REFERENCES

- 1 "Columbia River Treaty Principles and Procedures for the Preparation and Use of Hydroelectric Operating Plans, Columbia River Treaty Operating Committee," dated December 1991.
- 2 "Columbia River Treaty Entity Agreement on Principles for the Preparation of the Assured Operating Plan and Determination of Downstream Power Benefit Studies," dated 28 July 1988.
- 3 "Columbia River Treaty Entity Agreement on Changes to Procedures for the Preparation of the Assured Operating Plan and Determination of Downstream Power Benefit Studies," dated 12 August 1988.
- 4 "Columbia River Treaty Entity Agreement on the 1998/99, 1999/2000, and 2000/2001 Assured Operating Plan and Determination of Downstream Power Benefit Studies," dated 5 April 1995.
- 5 "Treaty between the United States of America and Canada relating to Cooperative Development of the Water Resources of the Columbia River Basin," dated 17 January 1961.
- 6 "Protocol - Annex to Exchange of Notes," dated 22 January 1964.
- 7 "Attachment Relating to Terms of Sale - Attachment to Exchange of Notes," dated 22 January 1964.
- 8 "Columbia River Treaty Flood Control Operating Plan," dated October 1972, as amended by the "Review of Flood Control, Columbia River Basin, Columbia River and Tributaries Study, CRT-63," dated June 1991.
- 9 "BPA Hydroelectric Power Planning Program, Assured Operating Plan 30-year System Regulation Study 01-41," dated 21 October 1996.
- 10 The conversion factors used are: (a) million acre-feet (Maf) times 1.2335 equals cubic kilometers (km^3); (b) thousand second-foot-days (ksfd) times 2.4466 equals cubic hectometers (hm^3); (c) cubic feet per second (cfs) divided by 35.3147 equals cubic meters per second (m^3/s); and (d) feet (ft) times 0.3048 equals meters (m).
- 11 "Report on 1990 Level Modified Streamflows, 1928 to 1989, Columbia River and Coastal Basins, prepared for BPA," dated July 1993.
- 12 See footnote 8.
- 13 Summary of "End-of-Period Reservoir Storage Requirement from Columbia River Flood Regulation Studies," dated July 1996.

14 See footnote 9.

15 See footnote 8.

16 Exchange of notes "Regarding the Disposal of the Canadian Entitlement to Downstream Power Benefits" dated 16 September 1964.

17 "Columbia River Treaty Entity Agreement on Aspects of the Canadian Entitlement Return for 1 April 1998 through 31 March 2003," executed 28 July 1992.

18 "Columbia River Treaty Entity Agreement on Aspects of the Delivery of the Canadian Entitlement for April 1, 1998 Through September 15, 2024" between the Canadian Entity and the United States Entity, dated 29 March 1999.

19 See footnote 18.

TABLE 1
(English Units)
MICA PROJECT OPERATING CRITERIA
2000-01 ASSURED OPERATING PLAN

Period	End of Previous Period Arrow Storage Content (ksfd)	Target Operation		Minimum Outflow (cfs)	Minimum Treaty Storage Content 2/ (ksfd)
		Period Average Outflow (cfs)	End-of-Period Treaty Content 1/ (ksfd)		
August 1-15	2600 - FULL 1650 - 2600 0 - 1650	- 17000 26000	3486.2	15000	0.0
August 16-31	3400 - FULL 1450 - 3400 0 - 1450	- 24000 27000	3529.2	15000	0.0
September	3460 - FULL 1600 - 3460 0 - 1600	- 22000 27000	3529.2	10000	0.0
October	3150 - FULL 1300 - 3150 0 - 1300	- 22000 28000	3386.2	10000	0.0
November	3070 - FULL 2320 - 3070 0 - 2320	- 22000 28000	3056.2	12000	0.0
December	2650 - FULL 1630 - 2650 0 - 1630	25000 27000 29000		21000	0.0
January	2430 - FULL 1270 - 2430 0 - 1270	26000 28000 30000		15000	106.2
February	2060 - FULL 2045 - 2060 0 - 2045	23000 21000 26000		15000	0.0
March	1680 - FULL 150 - 1680 0 - 150	22000 27000 32000		15000	0.0
April 1-15	1610 - FULL 60 - 1610 0 - 60	26000 - 12000	136.2	12000	0.0
April 16-30	1060 - FULL 20 - 1060 0 - 20	- - 10000	106.2 0.0	10000	0.0
May	1845 - FULL 220 - 1845 0 - 220	8000 10000 23000		8000	0.0
June	2080 - FULL 440 - 2080 0 - 440	8000 10000 17000		8000	0.0
July	3175 - FULL 1680 - 3175 0 - 1680	- 10000 21000	3456.2	8000	0.0

Notes:

1/ A maximum outflow of 24000 cfs will apply if the target end-of-period storage content @ Mica is less than 3529.2 ksfd in every month except April, May, and June. For these periods, the maximum outflow is 29000 cfs in April 1-15, 27000 cfs in April 16-30, 30000 cfs in May and 33000 cfs in June.

2/ Mica outflows will be reduced to minimum to maintain the reservoir above the minimum Treaty storage content. This will override any flow target.

TABLE 2
COMPARISON OF 2000-01 ASSURED OPERATING PLAN
STUDY RESULTS

Study 01-41 provides Optimum Generation in Canada and in the United States.
Study 01-11 provides Optimum Generation in the United States only.

	Study No. 01-41	Study No. 01-11	Net Gain	Weight	Value
1. Firm Energy Capability (aMW)					
U.S. System <u>1/</u>	11963.3	11963.6	-0.3		
Canada <u>2/</u> , <u>3/</u>	2901.8	2841.0	60.8		
Total	14865.1	14804.6	60.5	3	181.5
2. Dependable Peaking Capacity (MW)					
U.S. System <u>4/</u>	30867.0	30869.0	-2.0		
Canada <u>2/</u> , <u>5/</u>	5330.0	5366.0	-36.0		
Total	36197.0	36235.0	-38.0	1	-38.0
3. Average Annual Usable Secondary Energy (aMW)					
U.S. System <u>6/</u>	3139.2	3123.0	16.2		
Canada <u>2/</u> , <u>7/</u>	231.0	274.6	-43.6		
Total	3370.2	3397.6	-27.4	2	-54.8
Net Change in Value =					88.7

-
- 1/ U.S. System firm energy capability was determined over the U.S. system critical period beginning 1 September 1928 and ending 29 February 1932.
- 2/ Canadian system includes Mica, Arrow, Revelstoke, Kootenay Canal, Corra Linn, Upper Bonnington, Lower Bonnington, South Slocan, Brilliant, Seven Mile and Waneta.
- 3/ Canadian system firm energy capability was determined over the Canadian system critical period beginning 1 October 1940 and ending 30 April 1946.
- 4/ U.S. system dependable peaking capability was determined from January 1937.
- 5/ Canadian system dependable peaking capability was determined from December 1944.
- 6/ U.S. system 30-year average secondary energy limited to secondary market.
- 7/ Canadian system 30-year average generation minus firm energy capability.
-

TABLE 3
(English Units)
CRITICAL RULE CURVES
END OF PERIOD TREATY STORAGE CONTENTS (KSF)
2000 - 01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
MICA														
1928-29	3529.2	3529.2	3146.7	3299.0	2963.5	2381.5	1894.8	1899.9	1578.8	858.2	383.9	844.2	2491.6	3388.1
1929-30	3529.2	3520.3	3150.8	2568.9	1462.5	1121.8	749.4	733.0	580.4	13.0	0.0	293.9	925.1	2269.7
1930-31	2861.6	2948.8	2941.0	2170.6	1151.2	1038.4	878.0	782.4	636.2	2.8	0.0	0.0	816.4	1867.9
1931-32	1685.8	1802.5	1515.8	1147.5	513.5	9.1	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARROW														
1928-29	3579.6	3579.6	3536.6	3113.5	3030.1	2875.9	1696.6	876.5	968.2	508.5	359.0	896.1	2402.0	3033.0
1929-30	3338.5	3327.1	3214.6	3429.2	3199.4	2255.2	771.5	833.1	839.7	606.7	536.1	574.5	2393.6	3330.4
1930-31	3323.6	3305.8	3320.6	3210.8	3236.6	2165.2	644.5	556.0	782.1	539.7	346.3	502.2	2185.9	2228.6
1931-32	2471.8	2045.2	1920.1	1503.8	1422.8	1206.0	473.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DUNCAN														
1928-29	705.8	705.8	688.9	690.0	566.6	345.3	283.0	275.0	222.8	231.2	239.6	340.0	572.2	695.0
1929-30	705.8	696.7	617.8	474.4	281.1	111.2	1.2	0.1	8.8	32.0	55.3	170.0	320.0	473.0
1930-31	538.8	593.8	601.8	500.6	373.2	169.1	18.3	6.9	9.0	22.2	2.0	28.5	109.0	238.3
1931-32	240.0	200.0	170.0	160.0	1.3	8.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COMPOSITE														
1928-29	7814.6	7814.6	7372.2	7102.5	6560.2	5402.7	3876.2	3051.4	2769.8	1597.9	982.5	2080.3	5465.8	7116.1
1929-30	7573.5	7544.1	6983.2	6472.5	4943.0	3488.0	1522.1	1566.2	1428.9	651.7	591.4	1038.4	3638.7	6073.1
1930-31	6724.0	6848.4	6863.4	5882.0	4761.0	3372.7	1540.8	1345.3	1427.3	564.7	348.3	530.7	3111.3	4334.8
1931-32	4397.4	4047.7	3605.9	2811.3	1937.6	1223.1	483.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 4
(English Units)
MICA
ASSURED AND VARIABLE REFILL CURVES
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS
2000-01 ASSURED OPERATING PLAN

	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
ASSURED REFILL CURVE (KSFD)														
	950.0	1514.2	2117.5	2295.8	2361.1	2377.8	2372.4	1885.0	1364.8	1135.0	943.2	1193.1	2398.4	3529.2
VARIABLE REFILL CURVES (KSFD)														
1926-29							2977.6	2676.1	2423.2	2297.3	2247.9	2145.7	2830.8	3529.2
1929-30							1953.6	1612.5	1349.0	1242.6	1325.2	1533.1	2546.6	
1930-31							2213.1	1880.9	1613.2	1484.8	1497.9	1553.2	2621.8	"
1931-32							1261.4	1132.3	1087.7	990.6	1045.9	1256.4	2502.3	"
1932-33							1165.7	1072.0	1044.7	945.6	954.7	1152.7	2338.9	"
1933-34							628.1	310.3	241.8	158.3	264.5	898.7	2591.8	"
1934-35							1631.1	1442.6	1343.5	1252.4	1249.2	1360.1	2417.4	"
1935-36							1464.2	1253.2	1121.0	1006.8	1032.7	1303.9	2676.4	"
1936-37							2965.8	2643.7	2376.0	2239.3	2238.2	2159.4	2863.1	"
1937-38							1538.9	1426.8	1382.6	1289.5	1307.7	1481.6	2593.8	"
1938-39							2017.2	1753.5	1499.5	1397.2	1432.7	1576.7	2854.6	"
1939-40							1804.2	1496.6	1259.7	1151.5	1209.1	1369.6	2614.4	"
1940-41							2395.0	2083.7	1835.7	1726.4	1821.0	1933.5	2844.6	"
1941-42							2140.6	1952.4	1828.2	1708.2	1703.1	1783.8	2746.9	"
1942-43							2174.6	2040.4	1998.6	1895.4	1961.7	2114.4	2832.2	"
1943-44							3080.1	2735.3	2481.4	2347.7	2324.8	2266.6	3001.8	"
1944-45							2946.2	2664.7	2446.0	2331.8	2290.3	2193.3	2920.8	"
1945-46							958.1	815.5	768.9	659.9	687.8	949.6	2496.7	"
1946-47							1076.9	988.0	970.5	882.8	931.1	1216.2	2567.2	"
1947-48							1025.9	916.3	883.5	769.9	784.3	1009.9	2453.9	"
1948-49							2721.9	2587.4	2529.3	2425.1	2408.2	2397.9	3225.4	"
1949-50							1381.3	1232.4	1176.2	1066.9	1080.6	1233.0	2265.2	"
1950-51							1372.5	1271.3	1247.2	1155.6	1196.3	1353.2	2626.7	"
1951-52							1779.2	1635.4	1586.2	1470.7	1474.5	1651.2	2774.0	"
1952-53							2060.3	1934.5	1895.1	1791.9	1768.6	1807.7	2740.9	"
1953-54							936.4	822.5	806.7	711.1	730.1	925.3	2237.3	"
1954-55							1696.0	1598.2	1574.9	1484.9	1493.1	1576.8	2431.7	"
1955-56							1244.5	1129.0	1084.5	977.9	997.1	1250.2	2541.2	"
1956-57							1413.0	1290.3	1260.6	1166.0	1182.6	1337.1	2871.8	"
1957-58							1246.8	1137.0	1113.6	1024.5	1059.2	1232.9	2634.3	"
LIMITING RULE CURVE (KSFD)							628.1	310.3	114.3	0.0				
POWER DISCHARGE REQUIREMENTS (CFS):														
ASSURED REFILL CURVES														
	3000	3000	3000	3000	3000	3000	3000	20000	20000	20000	20000	20000	20000	20000
VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)														
					80 MAF --		3000	10000	10000	10000	12000	20000	20000	20000
					95 MAF --		3000	3000	3000	8000	12000	18000	20000	20000
					110 MAF --		3000	3000	3000	8000	12000	18000	20000	20000

TABLE 5
(English Units)
ARROW
ASSURED AND VARIABLE REFILL CURVES
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS
2000-01 ASSURED OPERATING PLAN

	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL	
ASSURED REFILL CURVE (KSFD)															
	0.0	541.4	1966.0	2114.1	2584.1	3218.6	3272.0	2787.3	2105.7	2110.0	2009.3	2630.5	3421.0	3579.6	
VARIABLE REFILL CURVES (KSFD)															
1928-29							3579.6	3579.6	3380.7	3481.8	3579.6	3572.4	3579.6	3579.6	
1929-30							2684.7	2386.8	2096.6	2002.5	2389.2	2963.9	3547.4	"	
1930-31							2892.9	2549.0	2236.6	2359.6	2593.4	2798.7	3560.5	"	
1931-32							1652.7	1071.0	172.7	1.1	0.0	1032.0	2769.6	"	
1932-33							"	"	"	"	212.9	1140.8	2707.5	"	
1933-34							"	"	"	"	222.2	1554.4	3256.4	"	
1934-35							"	"	822.6	917.2	1256.5	1833.5	2953.2	"	
1935-36							"	"	773.3	668.4	872.0	1829.2	3415.3	"	
1936-37							3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	"	
1937-38							1652.7	1071.0	460.4	683.5	1128.8	1915.3	3098.4	"	
1938-39							2820.7	2465.1	2114.4	2158.7	2481.0	2883.8	3579.6	"	
1939-40							2555.5	2244.4	1946.9	1859.3	2255.3	2663.9	"	"	
1940-41							3366.7	3213.3	2960.6	3200.9	3579.6	3579.6	"	"	
1941-42							2156.2	2033.7	2096.9	2348.5	2675.4	3006.1	"	"	
1942-43							1723.5	1728.9	1970.2	2303.7	2726.8	3306.7	3573.2	"	
1943-44							3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	3579.6	"	
1944-45							"	"	3536.7	"	"	"	"	"	
1945-46							1652.7	1071.0	172.7	1.1	139.0	1135.0	2913.1	"	
1946-47							"	"	251.0	307.7	582.9	1553.9	3066.2	"	
1947-48							"	"	172.7	98.8	307.4	1216.2	2910.6	"	
1948-49							"	1375.1	1639.3	2001.6	2401.1	2997.1	3579.6	"	
1949-50							"	1071.0	172.7	77.7	447.9	1197.5	2592.9	"	
1950-51							"	"	385.1	409.2	902.8	1662.3	3201.4	"	
1951-52							"	"	381.4	719.6	1123.1	2018.1	3315.7	"	
1952-53							"	"	1076.5	1437.0	1774.2	2299.4	3263.5	"	
1953-54							"	"	172.7	1.1	0.0	839.6	2581.7	"	
1954-55							"	"	"	537.3	974.9	1602.9	2559.2	"	
1955-56							"	"	"	1.1	158.2	1257.2	2956.6	"	
1956-57							"	"	"	"	361.6	1184.9	3410.6	"	
1957-58							"	"	"	"	241.2	1108.5	3072.6	"	
LIMITING RULE CURVE (KSFD)							1652.7	1071.0	172.7	1.1					
POWER DISCHARGE REQUIREMENTS (CFS):															
ASSURED REFILL CURVES															
	5000	5000	5000	5000	5000	5000	5000	40000	40000	40000	40000	40000	45000	50000	
VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLIES)															
							80 MAF --	5000	20000	22000	25000	30000	35000	42000	44000
							95 MAF --	5000	5000	5000	8000	20000	23000	33000	34300
							110 MAF --	5000	5000	5000	8000	20000	23000	33000	34300

TABLE 6
(English Units)
DUNCAN
ASSURED AND VARIABLE REFILL CURVES
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS
2000-01 ASSURED OPERATING PLAN

	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
ASSURED REFILL CURVE (KSFD)														
	114.3	185.2	251.5	282.2	299.7	310.9	321.1	291.1	261.8	254.0	246.2	360.0	540.9	705.8
VARIABLE REFILL CURVES (KSFD)														
1928-29							486.6	451.7	427.2	420.8	417.7	447.7	595.2	705.8
1929-30							484.9	449.7	424.9	418.2	429.1	468.4	606.6	"
1930-31							429.5	395.5	374.2	372.7	376.0	417.3	595.2	"
1931-32							9.3	1.4	15.2	32.5	82.0	219.5	501.2	"
1932-33							1.2	0.0	0.0	0.1	0.0	41.7	368.8	"
1933-34							"	8.8	27.9	51.2	127.8	279.7	559.2	"
1934-35							146.4	135.1	141.3	148.1	168.3	272.8	500.9	"
1935-36							112.6	92.9	86.1	89.3	111.3	246.6	535.6	"
1936-37							434.5	399.5	376.7	370.2	368.0	409.7	577.4	"
1937-38							80.0	79.4	91.1	107.3	143.8	275.4	525.8	"
1938-39							281.5	252.9	233.8	231.4	245.1	329.1	578.0	"
1939-40							265.8	241.7	229.9	237.1	252.2	331.2	568.6	"
1940-41							346.9	320.5	304.7	313.1	335.4	408.6	590.3	"
1941-42							253.7	244.9	246.4	254.1	275.1	368.5	566.4	"
1942-43							210.8	205.7	215.6	226.4	261.2	386.4	558.7	"
1943-44							503.6	473.2	453.6	449.3	447.7	480.8	625.4	"
1944-45							410.7	384.0	367.9	365.1	364.7	408.5	582.8	"
1945-46							1.2	0.0	0.0	0.1	10.6	165.2	494.6	"
1946-47							"	"	"	10.4	53.7	208.3	507.3	"
1947-48							37.2	33.9	46.3	58.8	90.2	225.4	517.8	"
1948-49							265.8	257.5	263.9	271.8	297.7	399.7	619.5	"
1949-50							68.8	61.5	70.5	79.4	110.3	234.2	461.8	"
1950-51							1.2	0.0	3.8	13.3	55.1	199.8	492.8	"
1951-52							98.3	92.5	104.6	115.0	147.5	284.8	537.9	"
1952-53							97.2	91.7	103.0	114.1	144.6	263.1	504.2	"
1953-54							1.2	0.0	0.0	0.1	0.0	126.8	434.9	"
1954-55							35.0	31.4	42.7	55.2	87.3	212.7	438.6	"
1955-56							1.2	0.0	0.0	0.1	4.8	173.4	490.5	"
1956-57							49.4	39.6	48.1	59.3	96.0	226.9	554.8	"
1957-58							1.2	0.0	0.0	0.1	18.5	164.1	506.6	"
LIMITING RULE CURVE (KSFD)							1.2	0.0	0.0	0.1				
POWER DISCHARGE REQUIREMENTS (CFS):														
ASSURED REFILL CURVES														
	100	100	100	100	100	100	100	1500	1500	1500	1500	1500	2000	2000
VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)														
80 MAF -							100	1000	1000	1000	2000	2000	2000	2200
95 MAF -							100	100	100	100	400	600	1800	2000
110 MAF -							100	100	100	100	400	600	1800	2000

TABLE 7
(English Units)
MICA
UPPER RULE CURVES (FLOOD CONTROL)
END OF PERIOD TREATY STORAGE CONTENTS (KSFD)
2000-01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
1928-29	3529.2	3529.2	3529.2	3428.4	3428.4	3428.4	3385.7	3347.2	3304.6	3304.6	3304.6	3369.1	3447.9	3529.2
1929-30	3352.6	3284.4	3208.7	3208.7	3208.7	3300.7	3413.2	.
1930-31	3428.4	3428.4	3428.4	3428.4	3428.4	3457.3	3492.7	.
1931-32	3105.7	2803.2	2480.5	2480.5	2480.5	2781.5	3149.6	.
1932-33	3101.7	2807.2	.	.	.	.	.	.
1933-34
1934-35
1935-36	3105.7	2803.2	.	.	.	.	.	.
1936-37	3330.6	3242.3	3144.5	3144.5	3144.5	3323.3	3398.4	.
1937-38	3101.7	2807.2	2480.5	2480.5	2480.5	2781.5	3149.6	.
1938-39	3193.8	2981.4	2746.8	2746.8	2746.8	2971.4	3246.0	.
1939-40	3274.3	3130.5	2976.4	2976.4	2976.4	3135.1	3329.1	.
1940-41	3428.4	3428.4	3428.4	3428.4	3428.4	3457.3	3492.7	.
1941-42	3101.7	2807.2	2480.5	2480.5	2480.5	2781.5	3149.6	.
1942-43
1943-44	3428.4	3428.4	3428.4	3428.4	3428.4	3457.3	3492.7	.
1944-45	3193.1	2980.2	2745.0	2745.0	2745.0	2970.0	3245.3	.
1945-46	3101.7	2807.2	2480.5	2480.5	2480.5	2781.5	3149.6	.
1946-47
1947-48	3105.7	2803.2	.	.	.	.	.	.
1948-49	3101.7	2807.2	.	.	.	.	.	.
1949-50
1950-51
1951-52	3105.7	2803.2	.	.	.	.	.	.
1952-53	3101.7	2807.2	.	.	.	.	.	.
1953-54
1954-55
1955-56	3105.7	2803.2	.	.	.	2695.5	3172.7	.
1956-57	3101.7	2807.2	.	.	.	2781.5	3149.6	.
1957-58

TABLE 8
(English Units)
ARROW
UPPER RULE CURVES (FLOOD CONTROL)
END OF PERIOD TREATY STORAGE CONTENTS (KSF)
2000-01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
1928-29	3579.6	3579.6	3579.6	3453.6	3453.6	3075.4	3075.4	3075.4	3075.4	3088.5	3111.2	3235.8	3579.6	3579.6
1929-30	2998.3	2928.3	2851.2	2870.1	2902.9	3082.8	.	.
1930-31	3075.4	3075.4	3075.4	3088.5	3111.2	3235.8	.	.
1931-32	2371.6	1712.7	1008.3	1016.0	1126.6	2224.5	.	.
1932-33	2363.5	1720.2	.	1008.3	1036.8	1781.7	3034.5	.
1933-34	1784.9	2327.4	3579.6	.
1934-35	1008.3	1725.7	3034.5	.
1935-36	2371.6	1712.7	.	1070.0	1373.5	2134.5	3579.6	.
1936-37	2940.8	2818.8	2684.1	2707.4	2755.8	3268.2	.	.
1937-38	2363.5	1720.2	1008.3	1082.9	1278.3	1831.1	3147.8	.
1938-39	2584.5	2141.3	1650.3	1719.8	1843.2	2681.3	3579.6	.
1939-40	2793.3	2529.4	2247.3	2287.2	2380.5	2913.4	.	.
1940-41	3075.4	3075.4	3075.4	3088.5	3111.2	3235.8	.	.
1941-42	2363.5	1720.2	1008.3	1084.9	1149.8	1934.0	.	.
1942-43	1111.2	1322.0	1440.3	2389.1	.
1943-44	3075.4	3075.4	3075.4	3088.5	3111.2	3235.8	3579.6	.
1944-45	2582.9	2138.0	1645.5	1672.5	1744.1	2368.8	3347.5	.
1945-46	2363.5	1720.2	1008.3	1072.6	1242.3	2201.4	3579.6	.
1946-47	1075.2	1360.6	2147.4	.	.
1947-48	2371.6	1712.7	.	1036.8	1183.2	2216.8	.	.
1948-49	2363.5	1720.2	.	1144.8	1378.0	2494.5	.	.
1949-50	1008.3	1008.3	1113.8	2232.3	.
1950-51	1355.5	3337.9	.
1951-52	2371.6	1712.7	.	1070.0	1345.2	1792.6	3013.9	.
1952-53	2363.5	1720.2	.	1057.2	1172.9	1476.3	.	.
1953-54	1134.3	1628.0	1898.0	.
1954-55	1075.2	1090.6	1653.7	3224.8	.
1955-56	2371.6	1712.7	.	1008.3	1216.6	1990.6	2993.4	.
1956-57	2363.5	1720.2	.	1077.8	1224.3	2651.4	3579.6	.
1957-58	1046.9	1190.9	2242.5	.	.

TABLE 9
(English Units)
DUNCAN
UPPER RULE CURVES (FLOOD CONTROL)
END OF PERIOD TREATY STORAGE CONTENTS (KSF)
2000-01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
1928-29	705.8	705.8	705.8	705.8	705.8	504.1	418.3	340.8	340.8	348.1	380.5	443.7	574.4	705.8
1929-30	408.4	322.1	322.1	329.8	342.8	430.3	567.7	.
1930-31	391.0	288.9	288.9	297.2	311.4	406.4	555.7	.
1931-32	277.3	85.5	85.5	80.9	109.1	281.3	609.8	.
1932-33	273.7	.	.	75.1	94.3	191.6	573.3	.
1933-34	85.5	127.0	339.6	605.3	.
1934-35	83.5	187.2	488.1	.
1935-36	277.3	.	.	71.3	119.3	351.7	705.8	.
1936-37	377.7	263.6	263.6	272.5	287.5	388.3	546.6	.
1937-38	293.0	102.3	102.3	113.1	119.2	245.3	551.9	.
1938-39	288.0	92.7	92.7	109.3	132.6	399.3	705.8	.
1939-40	303.2	115.4	115.4	127.2	150.9	410.6	.	.
1940-41	345.5	202.1	202.1	212.2	229.3	344.2	524.5	.
1941-42	328.5	169.9	169.9	179.0	201.5	436.9	705.8	.
1942-43	333.0	178.4	178.4	192.2	221.1	289.2	653.1	.
1943-44	416.4	334.7	334.7	342.1	354.7	439.4	572.2	.
1944-45	384.9	277.3	277.3	278.6	279.4	493.7	705.8	.
1945-46	273.7	85.5	85.5	75.7	95.6	322.3	647.5	.
1946-47	77.0	102.0	314.0	629.6	.
1947-48	277.3	.	.	85.5	85.5	300.5	705.8	.
1948-49	371.1	251.0	251.0	256.9	277.0	434.3	.	.
1949-50	273.7	85.5	85.5	85.5	85.5	183.9	525.3	.
1950-51	285.1	534.2	.
1951-52	277.3	.	.	.	87.4	92.4	255.0	.
1952-53	273.7	.	.	71.9	84.7	234.6	522.7	.
1953-54	73.2	84.1	237.1	547.6	.
1954-55	71.9	80.9	154.5	488.8	.
1955-56	277.3	.	.	85.5	84.7	266.6	585.4	.
1956-57	273.7	.	.	74.5	89.9	376.1	655.8	.
1957-58	77.0	96.3	359.4	705.8	.

TABLE 10
(English Units)
COMPOSITE OPERATING RULE CURVES
FOR THE WHOLE OF CANADIAN STORAGE
END OF PERIOD TREATY STORAGE CONTENTS (KSFD)
2000-01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
1928-29	7814.6	7814.6	7372.2	7102.5	6560.2	5802.2	5768.9	4978.3	3946.3	3499.0	3198.7	4183.6	6484.8	7814.6
1929-30	"	"	"	"	"	"	4959.4	4290.4	3707.4	3391.5	3198.7	4183.6	6480.3	"
1930-31	"	"	"	"	"	"	5427.1	4718.8	3946.3	3499.0	3198.7	4183.6	6468.3	"
1931-32	"	"	"	"	"	"	2923.4	2204.7	1275.6	1024.2	1025.2	2444.6	5762.4	"
1932-33	"	"	"	"	"	"	2819.8	2143.0	1217.4	946.8	1156.1	2335.2	5413.2	"
1933-34	"	"	"	"	"	"	2282.0	1390.1	442.4	210.6	613.7	2732.8	6307.2	"
1934-35	"	"	"	"	"	"	3430.2	2579.1	2231.6	2117.7	2035.0	3106.0	5858.7	"
1935-36	"	"	"	"	"	"	3229.5	2389.7	1959.8	1746.5	1926.5	3268.9	6442.5	"
1936-37	"	"	"	"	"	"	5634.3	4950.8	3946.3	3499.0	3198.7	4183.6	6459.2	"
1937-38	"	"	"	"	"	"	3271.8	2577.2	1934.1	1925.8	2191.2	3269.5	6115.8	"
1938-39	"	"	"	"	"	"	4863.2	3987.5	3242.5	2964.1	2919.0	4152.7	6484.8	"
1939-40	"	"	"	"	"	"	4625.5	3856.4	3322.0	3121.5	3103.4	4154.8	6479.2	"
1940-41	"	"	"	"	"	"	5768.9	4889.3	3886.6	3457.2	3181.8	4167.8	6437.1	"
1941-42	"	"	"	"	"	"	4550.5	3790.0	2757.0	2378.9	2294.5	3487.1	6479.0	"
1942-43	"	"	"	"	"	"	4108.9	3798.5	2765.5	2438.4	2486.3	2922.6	5439.4	"
1943-44	"	"	"	"	"	"	5768.9	4978.3	3946.3	3499.0	3198.7	4183.6	6484.8	"
1944-45	"	"	"	"	"	"	5276.4	4315.2	3486.1	3061.5	2933.5	3921.9	6411.3	"
1945-46	"	"	"	"	"	"	2612.0	1886.5	941.6	661.1	837.4	2249.8	5899.3	"
1946-47	"	"	"	"	"	"	2730.8	2059.0	1221.5	1200.9	1567.7	2955.3	6065.1	"
1947-48	"	"	"	"	"	"	2715.8	2021.2	1102.5	925.5	1157.2	2451.5	5882.1	"
1948-49	"	"	"	"	"	"	4290.9	3526.0	2838.1	2533.6	2565.4	4047.6	6484.8	"
1949-50	"	"	"	"	"	"	3102.8	2364.9	1414.4	1210.1	1456.6	2490.8	4959.3	"
1950-51	"	"	"	"	"	"	3026.4	2342.3	1635.9	1557.5	1901.1	2748.4	6185.8	"
1951-52	"	"	"	"	"	"	3530.2	2771.9	2025.7	1920.1	2133.7	3078.1	5760.5	"
1952-53	"	"	"	"	"	"	3810.2	3036.4	2652.6	2264.1	2200.8	2904.0	6009.7	"
1953-54	"	"	"	"	"	"	2590.3	1893.5	979.4	712.3	730.1	1891.7	4570.2	"
1954-55	"	"	"	"	"	"	3383.7	2700.6	1790.3	1727.5	1999.0	2950.5	5429.5	"
1955-56	"	"	"	"	"	"	2898.4	2200.0	1257.2	979.1	1106.2	2623.7	5938.7	"
1956-57	"	"	"	"	"	"	3115.1	2400.9	1481.4	1195.4	1394.7	2604.9	6457.0	"
1957-58	"	"	"	"	"	"	2900.7	2208.0	1286.3	1025.7	1202.9	2465.7	6070.8	"

Note: The above ORC's are limited to individual project flood control rule curves. Prior AOP's did not include the flood control limit in the Table 10 list of ORC's although it has always been limited in the hydroregulation model.

TABLE 11
(English Units)
COMPARISON OF
RECENT ASSURED OPERATING PLAN STUDIES

	1996-97	1997-98	1998-99	1999-00	2000-01
MICA TARGET OPERATION					
(ksfd[xxxx.x] or cfs [xxxxx])					
AUG 15	3456.2	3456.2	3456.2	3456.2	3486.2
AUG 31	FULL	FULL	FULL	FULL	FULL
SEP	FULL	FULL	FULL	FULL	FULL
OCT	14000	15000	11000	3428.2	3386.2
NOV	19000	19000	3256.2	3176.2	3056.2
DEC	23000	23000	2676.2	24000	25000
JAN	24000	24000	24000	25000	26000
FEB	20000	22000	22000	22000	23000
MAR	19000	19000	22000	21000	22000
APR 15	156.2	106.2	86.2	156.2	26000
APR 30	0.0	0.0	56.2	106.2	106.2
MAY	10000	10000	10000	10000	8000
JUN	10000	10000	10000	10000	8000
JUL	3356.2	3356.2	3406.2	3456.2	3456.2
COMPOSITE CRC1 CANADIAN TREATY STORAGE CONTENT (ksfd)					
1928 AUG 31	7814.6	7814.6	7814.6	7814.6	7814.6
1928 DEC	5131.2	5755.8	6250.9	5618.4	5402.7
1929 APR 15	120.3	678.7	1676.3	1763.1	1597.9
1929 JUL	6786.0	6863.4	7005.8	6916.0	7116.1
COMPOSITE 50-YR AVERAGE CANADIAN TREATY STORAGE CONTENT (ksfd)					
AUG 31	7357.3	7212.1	7323.8	7295.4	7389.8
DEC	4794.1	5224.7	5584.3	5283.1	5157.8
APR 15	653.0	729.7	888.6	1424.0	1150.7
JUL	7121.9	7117.9	7110.7	7099.3	7273.7
STEP 1 GAINS AND LOSSES DUE TO REOPERATION (MW)					
U.S. Firm Energy	-2.0	-0.9	-5.1	-1.5	-0.3
U.S. Dependable Peaking Capacity	3.0	-4.0	27.0	0.0	-2.0
U.S. Average Annual Usable Secondary Energy	1.2	13.9	18.9	19.5	16.2
BCH Firm Energy	36.0	46.7	26.7	102.2	60.8
BCH Dependable Peaking Capacity	-10.0	19.0	18.0	-3.0	-36.0
BCH Average Annual Usable Secondary Energy	-36.9	-43.5	-18.5	-42.9	-43.6
COORDINATED HYDRO MODEL LOAD (MW)					
AUG 15	10047	10223	10083	9793	10043
AUG 31	10055	10259	10203	9925	10125
SEP	10028	10121	9957	9630	10095
OCT	10508	10153	9963	9764	10046
NOV	11716	11452	11305	11297	11381
DEC	12738	12582	12787	12766	12836
JAN	13340	13477	13640	13725	13484
FEB	12581	12664	12638	12674	12765
MAR	12277	11948	11994	12113	11807
APR 15	13045	12643	11671	11099	11332
APR 30	14550	13437	12425	12672	13025
MAY	15720	16270	15701	17263	14347
JUN	11426	13781	14662	14699	11925
JUL	<u>10559</u>	<u>10386</u>	<u>10594</u>	<u>9894</u>	<u>11275</u>
ANNUAL AVERAGE	12061	12171	12117	12131	11850

Table 1M - Mica Project Operating Criteria (Metric Units)

TABLE 1M (Metric Units) MICA PROJECT OPERATING CRITERIA 2000-01 ASSURED OPERATING PLAN					
Period	End of Previous Period Arrow Storage Content (hm^3)	Target Operation		Minimum Outflow (m^3/s)	Minimum Treaty Storage Content 2/ (hm^3)
		Period Average Outflow (m^3/s)	End-of-Period Treaty Content 1/ (hm^3)		
August 1-15	6361.2 - FULL 4036.9 - 6361.2 0.0 - 4036.9	- 481.39 736.24	8529.3	424.75	0.0
August 16-31	8318.4 - FULL 3547.6 - 8318.4 0.0 - 3547.6	- 679.80 764.55	8634.5	424.75	0.0
September	8465.2 - FULL 3914.6 - 8465.2 0.0 - 3914.6	- 622.97 764.55	8634.5	283.17	0.0
October	7706.8 - FULL 3180.6 - 7706.8 0.0 - 3180.6	- 622.97 762.87	8284.7	283.17	0.0
November	7511.1 - FULL 5676.1 - 7511.1 0.0 - 5676.1	- 622.97 762.87	7477.3	339.80	0.0
December	6483.5 - FULL 4721.9 - 6483.5 0.0 - 4721.9	707.92 764.55 821.19		594.65	0.0
January	5945.2 - FULL 3107.2 - 5945.2 0.0 - 3107.2	736.24 792.87 849.50		424.75	259.8
February	5015.5 - FULL 5003.3 - 5015.5 0.0 - 5003.3	651.29 594.65 736.24		424.75	0.0
March	4110.3 - FULL 367.0 - 4110.3 0.0 - 367.0	622.97 764.55 0.00		424.75	0.0
April 1-15	4426.3 - FULL 122.3 - 4426.3 0.0 - 122.3	736.24 - 339.80	333.2	339.80	0.0
April 16-30	2588.9 - FULL 48.9 - 2588.9 0.0 - 48.9	- - 283.17	259.8 0.0	283.17	0.0
May	4514.0 - FULL 538.3 - 4514.0 0.0 - 538.3	226.53 283.17 651.29		226.53	0.0
June	5040.0 - FULL 1076.5 - 5040.0 0.0 - 1076.5	226.53 283.17 481.39		226.53	0.0
July	7768.0 - FULL 4061.4 - 7768.0 0.0 - 4061.4	- 283.17 594.65	8455.9	226.53	0.0

Notes:

1/ A maximum outflow of 962.77 m^3/s will apply if the target end-of-period storage content @ Mica is less than 8634.5 hm^3 in every month except April, May, and June. For these periods, the maximum outflow is 821.19 m^3/s in April 1-15, 764.55 m^3/s in April 16-30, 849.50 m^3/s in May and 934.46 m^3/s in June.

2/ Mica outflows will be reduced to minimum to maintain the reservoir above the minimum Treaty storage content. This will override any flow target.

TABLE 3M
(Metric Units)
CRITICAL RULE CURVES
END OF PERIOD TREATY STORAGE CONTENTS (hm³)
2000 - 01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
MICA														
1928-29	8634.5	8634.5	7698.7	8071.3	7250.5	5826.6	4635.3	4648.3	3862.7	2099.7	939.2	2065.4	6095.9	8289.3
1929-30	8634.5	8612.8	7708.7	6285.1	3578.2	2744.1	1833.5	1793.4	1420.0	31.8	0.0	719.1	2263.3	5553.0
1930-31	7001.2	7214.5	7195.5	5310.6	2816.5	2540.5	2148.1	1914.2	1556.5	6.9	0.0	0.0	1997.4	4570.0
1931-32	4124.0	4410.0	3708.6	2807.5	1256.3	22.3	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARROW														
1928-29	8757.8	8757.8	8652.6	7617.5	7413.4	6546.9	4155.8	2144.4	2368.8	1244.1	878.3	2192.4	5876.7	7420.5
1929-30	8168.0	8140.1	7864.8	8389.9	7827.7	5517.6	1887.6	2038.3	2054.4	1484.4	1311.6	1405.6	5856.2	8148.2
1930-31	8131.5	8088.0	8124.2	7855.5	7918.7	5297.4	1576.8	1360.3	1913.5	1320.4	847.3	1228.7	5348.0	5452.5
1931-32	6047.5	5003.8	4697.7	3679.2	3481.0	2950.6	1158.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DUNCAN														
1928-29	1726.8	1726.8	1685.5	1688.2	1386.2	844.8	692.4	672.8	545.1	565.7	586.2	831.8	1399.9	1700.4
1929-30	1726.8	1704.5	1511.5	1160.7	687.7	272.1	2.9	0.2	21.5	78.3	135.3	415.9	782.9	1157.2
1930-31	1318.2	1452.8	1472.4	1224.8	913.1	413.7	44.8	16.9	22.0	54.3	4.9	69.7	266.7	583.0
1931-32	587.2	489.3	415.9	391.5	3.2	19.6	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COMPOSITE														
1928-29	19119.2	19119.2	18036.8	17377.0	16050.2	13218.2	9483.5	7465.6	6776.6	3909.4	2403.8	5089.7	13372.6	17410.3
1929-30	18529.3	18457.4	17085.1	15835.6	12093.5	8533.7	3724.0	3831.9	3495.9	1594.4	1446.9	2540.5	8902.4	14858.4
1930-31	16450.9	16755.3	16792.0	14390.9	11648.3	8251.6	3769.7	3291.4	3492.0	1381.6	852.2	1298.4	7612.1	10605.5
1931-32	10758.7	9903.1	8822.2	6878.1	4740.5	2992.4	1183.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 4M
(Metric Units)
MICA

ASSURED AND VARIABLE REFILL CURVES
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS
2000-01 ASSURED OPERATING PLAN

	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
ASSURED REFILL CURVE (hm³)														
	2324.3	3704.6	5180.7	5616.9	5776.7	5817.0	5804.3	4611.8	3339.1	2776.9	2307.6	2919.0	5867.9	8634.5
VARIABLE REFILL CURVES (hm³)														
1928-29							7285.0	6547.3	5928.6	5620.6	5499.7	5249.7	6925.8	8634.5
1929-30							4779.7	3945.1	3300.5	3040.1	3242.2	3750.9	6230.5	"
1930-31							5414.6	4601.8	3946.9	3632.7	3664.8	3800.1	6414.5	"
1931-32							3086.1	2770.3	2661.2	2423.6	2558.9	3073.9	6122.1	"
1932-33							2852.0	2622.6	2556.0	2313.5	2335.8	2820.2	5722.4	"
1933-34							1536.7	759.2	591.6	387.3	647.1	2198.8	6340.6	"
1934-35							3990.6	3529.5	3287.0	3064.1	3056.3	3327.6	5914.4	"
1935-36							3582.3	3066.1	2742.6	2463.2	2526.6	3190.1	6548.1	"
1936-37							7256.1	6468.1	5813.1	5478.7	5478.0	5283.2	7004.9	"
1937-38							3765.1	3490.8	3382.7	3154.9	3199.4	3624.9	6346.0	"
1938-39							4935.3	4290.1	3668.7	3418.4	3505.2	3857.6	6984.1	"
1939-40							4414.2	3661.8	3082.0	2817.3	2958.2	3350.9	6396.4	"
1940-41							5859.6	5098.0	4491.2	4223.8	4455.3	4730.5	6959.6	"
1941-42							5237.2	4776.7	4472.9	4179.3	4166.8	4364.2	6720.6	"
1942-43							5320.4	4992.0	4889.8	4637.3	4799.5	5173.1	6929.3	"
1943-44							7535.8	6692.2	6071.0	5743.9	5687.9	5545.5	7344.2	"
1944-45							7208.2	6519.5	5984.4	5705.0	5603.4	5366.1	7146.0	"
1945-46							2344.1	1995.2	1881.2	1614.5	1682.8	2323.3	6106.4	"
1946-47							2634.7	2417.2	2374.4	2159.9	2278.0	2975.6	6260.9	"
1947-48							2510.0	2241.6	2161.6	1883.6	1918.9	2470.8	6003.7	"
1948-49							6659.4	6330.3	6188.2	5933.2	5891.9	5866.7	7891.3	"
1949-50							3379.5	3015.2	2877.7	2610.3	2643.8	3016.7	5542.0	"
1950-51							3358.0	3110.4	3051.4	2827.3	2926.9	3310.7	6426.5	"
1951-52							4353.0	4001.2	3880.8	3598.2	3607.5	4039.8	6786.9	"
1952-53							5040.7	4732.9	4636.6	4384.1	4327.1	4422.7	6705.9	"
1953-54							2291.0	2012.3	1973.7	1739.8	1786.3	2263.8	5473.8	"
1954-55							4149.4	3910.2	3853.2	3633.0	3653.0	3857.8	5949.4	"
1955-56							3044.8	2762.2	2653.3	2392.5	2439.5	3058.7	6217.3	"
1956-57							3457.0	3156.8	3084.2	2852.7	2893.3	3271.3	7026.1	"
1957-58							3050.4	2781.8	2724.5	2506.5	2591.4	3016.4	6445.1	"
LIMITING RULE CURVE (hm³)							1536.7	759.2	279.6	0.0				
POWER DISCHARGE REQUIREMENTS (m³/s):														
ASSURED REFILL CURVES														
	84.95	84.95	84.95	84.95	84.95	84.95	84.95	566.34	566.34	566.34	566.34	566.34	566.34	566.34
VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)														
					98.68 km ³ -		84.95	283.17	283.17	283.17	339.80	566.34	566.34	566.34
					117.18 km ³ -		84.95	84.95	84.95	226.53	339.80	509.70	566.34	566.34
					135.69 km ³ -		84.95	84.95	84.95	226.53	339.80	509.70	566.34	566.34

TABLE 5M
(Metric Units)
ARROW
ASSURED AND VARIABLE REFILL CURVES
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS
2000-01 ASSURED OPERATING PLAN

	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
ASSURED REFILL CURVE (hm³)														
0.0 1324.6			4810.0	5172.4	6322.3	7874.6	8005.3	6819.4	5151.8	5162.3	4916.0	6435.8	8369.8	8757.8
VARIABLE REFILL CURVES (hm³)														
1928-29							8757.8	8757.8	8271.2	8518.6	8757.8	8740.2	8757.8	8757.8
1929-30							6568.4	5839.5	5129.5	4899.3	5845.4	7251.5	8679.1	"
1930-31							7077.8	6236.4	5472.1	5773.0	6345.0	6847.3	8711.1	"
1931-32							4043.5	2620.3	422.5	2.7	0.0	2524.9	6776.1	"
1932-33							"	"	"	"	520.9	2791.1	6624.2	"
1933-34							"	"	"	"	543.6	3803.0	7967.1	"
1934-35							"	"	2012.6	2244.0	3074.2	4485.8	7225.3	"
1935-36							"	"	1892.0	1635.3	2133.4	4475.3	8355.9	"
1936-37							8757.8	8757.8	8757.8	8757.8	8757.8	8757.8	8757.8	"
1937-38							4043.5	2620.3	1126.4	1672.3	2761.7	4686.0	7580.5	"
1938-39							8901.1	6031.1	5173.1	5281.5	6070.0	7055.5	8757.8	"
1939-40							6252.3	5491.1	4763.3	4549.0	5517.8	6517.5	"	"
1940-41							8237.0	7861.7	7243.4	7831.3	8757.8	8757.8	"	"
1941-42							5275.4	4975.7	5130.3	5745.8	6545.6	7354.7	"	"
1942-43							4216.7	4229.9	4820.3	5636.2	6671.4	8090.2	8742.2	"
1943-44							8757.8	8757.8	8757.8	8757.8	8757.8	8757.8	8757.8	"
1944-45							"	"	8652.9	"	"	"	"	"
1945-46							4043.5	2620.3	422.5	2.7	340.1	2776.9	7127.2	"
1946-47							"	"	614.1	752.8	1426.1	3801.8	7501.8	"
1947-48							"	"	422.5	241.7	752.1	2975.6	7121.1	"
1948-49							"	3364.3	4010.7	4897.1	5874.5	7332.7	8757.8	"
1949-50							"	2620.3	422.5	190.1	1095.8	2929.8	6343.8	"
1950-51							"	"	942.2	1001.1	2208.8	4067.0	7832.5	"
1951-52							"	"	933.1	1760.6	2747.8	4937.5	8112.2	"
1952-53							"	"	2633.8	3515.8	4340.8	5625.7	7984.5	"
1953-54							"	"	422.5	2.7	0.0	2054.2	6316.4	"
1954-55							"	"	"	1314.6	2385.2	3921.7	6261.3	"
1955-56							"	"	"	2.7	387.1	3075.9	7233.6	"
1956-57							"	"	"	"	884.7	2899.0	8344.4	"
1957-58							"	"	"	"	590.1	2712.1	7517.4	"
LIMITING RULE CURVE (hm³)							4043.5	2620.3	422.5	2.7				
POWER DISCHARGE REQUIREMENTS (m³/s):														
ASSURED REFILL CURVES														
141.58 141.58 141.58 141.58 141.58							141.58	1132.67	1132.67	1132.67	1132.67	1132.67	1274.26	1415.84
VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)														
98.66 km ³ -							141.58	566.34	622.97	707.92	849.50	991.09	1189.31	1245.94
117.18 km ³ -							141.58	141.58	141.58	226.53	566.34	651.29	934.46	971.27
135.69 km ³ -							141.58	141.58	141.58	226.53	566.34	651.29	934.46	971.27

TABLE 6M
(Metric Units)
DUNCAN
ASSURED AND VARIABLE REFILL CURVES
LIMITING RULE CURVE AND POWER DISCHARGE REQUIREMENTS
2000-01 ASSURED OPERATING PLAN

	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
ASSURED REFILL CURVE (hm³)														
	279.6	453.1	615.3	690.4	733.2	760.6	785.6	712.2	640.5	621.4	602.4	880.8	1323.4	1726.8
VARIABLE REFILL CURVES (hm³)														
1928-29							1190.5	1105.1	1045.2	1029.5	1021.9	1095.3	1456.2	1726.8
1929-30							1186.4	1100.2	1039.6	1023.2	1049.8	1146.0	1484.1	"
1930-31							1050.8	967.6	915.5	911.8	919.9	1021.0	1456.2	"
1931-32							22.8	3.4	37.2	79.5	200.6	537.0	1226.2	"
1932-33							2.9	0.0	0.0	0.2	0.0	102.0	897.4	"
1933-34							"	21.5	68.3	125.3	312.7	684.3	1366.1	"
1934-35							358.2	330.5	345.7	362.3	411.8	667.4	1225.5	"
1935-36							275.5	227.3	210.7	218.5	272.3	603.3	1310.4	"
1936-37							1063.0	977.4	921.6	905.7	900.3	1002.4	1412.7	"
1937-38							195.7	194.3	222.9	262.5	351.8	873.8	1286.4	"
1938-39							688.7	618.7	572.0	566.1	599.7	805.2	1414.1	"
1939-40							650.3	591.3	562.5	580.1	617.0	810.3	1386.2	"
1940-41							848.7	784.1	745.5	766.0	820.6	999.7	1444.2	"
1941-42							620.7	599.2	602.8	621.7	673.1	901.6	1385.8	"
1942-43							515.7	503.3	527.5	553.9	639.1	945.4	1366.9	"
1943-44							1232.1	1157.7	1109.8	1099.3	1095.3	1176.3	1530.1	"
1944-45							1004.8	939.5	900.1	893.3	892.3	999.4	1425.9	"
1945-46							2.9	0.0	0.0	0.2	25.9	404.2	1210.1	"
1946-47							"	"	"	25.4	131.4	509.6	1241.2	"
1947-48							91.0	82.9	113.3	139.0	220.7	551.5	1266.4	"
1948-49							650.3	630.0	645.7	665.0	728.4	977.9	1515.7	"
1949-50							168.3	150.5	172.5	194.3	269.9	573.0	1129.8	"
1950-51							2.9	0.0	8.8	32.5	134.8	488.8	1205.7	"
1951-52							240.5	226.3	255.9	281.4	360.9	696.8	1316.0	"
1952-53							237.8	224.4	252.0	279.2	353.8	643.7	1233.6	"
1953-54							2.9	0.0	0.0	0.2	0.0	310.2	1064.0	"
1954-55							85.6	76.8	104.5	135.1	213.6	520.4	1073.1	"
1955-56							2.9	0.0	0.0	0.2	11.7	424.2	1200.1	"
1956-57							120.9	96.9	117.7	145.1	234.9	555.1	1357.4	"
1957-58							2.9	0.0	0.0	0.2	45.3	401.5	1239.4	"
LIMITING RULE CURVE (hm³)														
							2.9	0.0	0.0	0.2				
POWER DISCHARGE REQUIREMENTS (m³/s):														
ASSURED REFILL CURVES														
	2.83	2.83	2.83	2.83	2.83	2.83	2.83	42.48	42.48	42.48	42.48	42.48	56.63	56.63
VARIABLE REFILL CURVES (VOLUME RUNOFF AT THE DALLES)														
					98.68 km ³ -		2.83	28.32	28.32	28.32	56.63	56.63	56.63	62.30
					117.18 km ³ -		2.83	2.83	2.83	2.83	11.33	16.99	50.97	56.63
					135.69 km ³ -		2.83	2.83	2.83	2.83	11.33	16.99	50.97	56.63

TABLE 7M
(Metric Units)
MICA
UPPER RULE CURVES (FLOOD CONTROL)
END OF PERIOD TREATY STORAGE CONTENTS (hm³)
2000-01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
1928-29	8634.5	8634.5	8634.5	8387.9	8387.9	8387.9	8283.5	8189.3	8085.0	8085.0	8085.0	8242.8	8435.8	8634.5
1929-30	8202.5	8035.6	7850.4	7850.4	7850.4	8075.5	8350.7	.
1930-31	8387.9	8387.9	8387.9	8387.9	8387.9	8458.6	8545.2	.
1931-32	7598.4	6858.3	6068.8	6068.8	6068.8	6805.2	7705.8	.
1932-33	7588.6	6868.1	.	.	.	.	.	.
1933-34
1934-35
1935-36	7598.4	6858.3	.	.	.	.	.	.
1936-37	8148.6	7932.6	7693.3	7693.3	7693.3	8130.8	8314.5	.
1937-38	7588.6	6868.1	6068.8	6068.8	6068.8	6805.2	7705.8	.
1938-39	7814.0	7294.3	6720.3	6720.3	6720.3	7269.8	7941.7	.
1939-40	8010.9	7659.1	7282.1	7282.1	7282.1	7670.3	8145.0	.
1940-41	8387.9	8387.9	8387.9	8387.9	8387.9	8458.6	8545.2	.
1941-42	7588.6	6868.1	6068.8	6068.8	6068.8	6805.2	7705.8	.
1942-43
1943-44	8387.9	8387.9	8387.9	8387.9	8387.9	8458.6	8545.2	.
1944-45	7812.2	7291.4	6715.9	6715.9	6715.9	7268.4	7940.0	.
1945-46	7588.6	6868.1	6068.8	6068.8	6068.8	6805.2	7705.8	.
1946-47
1947-48	7598.4	6858.3	.	.	.	.	.	.
1948-49	7588.6	6868.1	.	.	.	.	.	.
1949-50
1950-51
1951-52	7598.4	6858.3	.	.	.	.	.	.
1952-53	7588.6	6868.1	.	.	.	.	.	.
1953-54
1954-55
1955-56	7598.4	6858.3	.	.	.	6594.8	7762.3	.
1956-57	7588.6	6868.1	.	.	.	6805.2	7705.8	.
1957-58

TABLE 8M
(Metric Units)
ARROW
UPPER RULE CURVES (FLOOD CONTROL)
END OF PERIOD TREATY STORAGE CONTENTS (hm³)
2000-01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
1928-29	8757.8	8757.8	8757.8	8449.6	8449.6	7524.3	7524.3	7524.3	7524.3	7556.3	7611.9	7916.7	8757.8	8757.8
1929-30	7335.6	7164.4	6975.7	7022.0	7102.2	7542.4	.	.
1930-31	7524.3	7524.3	7524.3	7556.3	7611.9	7916.7	.	.
1931-32	5802.4	4190.3	2466.9	2485.7	2756.3	5442.5	.	.
1932-33	5782.5	4208.6	.	2466.9	2536.1	4310.2	7424.2	.
1933-34	4366.9	5694.2	8757.8	.
1934-35	2466.9	4222.1	7424.2	.
1935-36	5802.4	4190.3	.	2617.9	3360.4	5222.3	8757.8	.
1936-37	7195.0	6896.5	6566.9	6623.9	6742.3	7991.1	.	.
1937-38	5782.5	4208.6	2466.9	2649.4	3127.5	4480.0	7700.9	.
1938-39	6323.2	5238.9	4037.6	4207.7	4509.6	6511.1	8757.8	.
1939-40	6834.1	6188.4	5498.2	5595.9	5824.1	7127.9	.	.
1940-41	7524.3	7524.3	7524.3	7556.3	7611.9	7916.7	.	.
1941-42	5782.5	4208.6	2466.9	2605.4	2813.1	4731.7	.	.
1942-43	2718.7	3234.4	3523.8	5845.2	.
1943-44	7524.3	7524.3	7524.3	7556.3	7611.9	7916.7	8757.8	.
1944-45	6319.3	5230.8	4025.9	4091.9	4267.1	5795.5	8190.0	.
1945-46	5782.5	4208.6	2466.9	2624.2	3039.4	5385.9	8757.8	.
1946-47	2630.6	3326.8	5253.8	.	.
1947-48	5802.4	4190.3	.	2536.1	2894.8	5423.8	.	.
1948-49	5782.5	4208.6	.	2800.4	3366.5	6103.0	.	.
1949-50	2466.9	2466.9	2725.0	5461.5	.
1950-51	3316.4	8166.5	.
1951-52	5802.4	4190.3	.	2617.9	3291.2	4385.8	7373.8	.
1952-53	5782.5	4208.6	.	2586.5	2869.6	3611.9	.	.
1953-54	2775.2	3983.1	4643.6	.
1954-55	2630.6	2668.3	4045.9	7889.8	.
1955-56	5802.4	4190.3	.	2466.9	2976.5	4870.2	7323.7	.
1956-57	5782.5	4208.6	.	2636.9	2995.4	6486.9	8757.8	.
1957-58	2561.3	2913.7	5486.5	.	.

TABLE 9M
(Metric Units)
DUNCAN
UPPER RULE CURVES (FLOOD CONTROL)
END OF PERIOD TREATY STORAGE CONTENTS (hm³)
2000-01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
1926-29	1726.8	1726.8	1726.8	1726.8	1726.8	1233.3	1023.4	833.8	833.8	851.7	882.0	1085.6	1405.3	1726.8
1929-30	999.2	788.0	788.0	806.9	838.7	1052.8	1388.9	.
1930-31	956.6	706.8	706.8	727.1	761.9	994.3	1359.6	.
1931-32	878.4	160.3	160.3	197.9	266.9	688.2	1491.9	.
1932-33	669.6	.	.	183.7	230.7	468.8	1402.6	.
1933-34	160.3	310.7	830.9	1480.9	.
1934-35	204.3	458.0	1194.2	.
1935-36	678.4	.	.	174.4	291.9	860.5	1726.8	.
1936-37	824.1	644.9	644.9	666.7	703.4	950.0	1337.3	.
1937-38	716.9	250.3	250.3	276.7	291.6	600.2	1350.3	.
1938-39	704.6	226.8	226.8	267.4	324.4	976.9	1726.8	.
1939-40	741.8	282.3	282.3	311.2	369.2	1004.6	.	.
1940-41	845.3	494.5	494.5	519.2	561.0	842.1	1283.2	.
1941-42	803.7	415.7	415.7	437.9	493.0	1073.8	1726.8	.
1942-43	814.7	436.5	436.5	470.2	540.9	707.6	1597.9	.
1943-44	1018.8	818.9	818.9	837.0	867.8	1075.0	1399.9	.
1944-45	941.7	678.4	678.4	681.6	683.6	1207.9	1726.8	.
1945-46	669.6	160.3	160.3	185.2	233.9	788.5	1584.2	.
1946-47	188.4	249.6	768.2	1540.4	.
1947-48	678.4	.	.	160.3	160.3	735.2	1726.8	.
1948-49	907.9	614.1	614.1	628.5	677.7	1062.6	.	.
1949-50	669.6	160.3	160.3	160.3	160.3	449.9	1285.2	.
1950-51	697.5	1307.0	.
1951-52	678.4	.	.	.	164.9	226.1	623.9	.
1952-53	669.6	.	.	175.9	207.2	574.0	1278.8	.
1953-54	179.1	205.8	580.1	1339.8	.
1954-55	175.9	197.9	378.0	1195.9	.
1955-56	678.4	.	.	160.3	207.2	652.3	1432.2	.
1956-57	669.6	.	.	182.3	219.9	920.2	1604.5	.
1957-58	188.4	235.6	879.3	1726.8	.

TABLE 10M
(Metric Units)
COMPOSITE OPERATING RULE CURVES
FOR THE WHOLE OF CANADIAN STORAGE
END OF PERIOD TREATY STORAGE CONTENTS (hm³)
2000-01 ASSURED OPERATING PLAN

YEAR	AUG15	AUG31	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR15	APR30	MAY	JUN	JUL
1928-29	19119.2	19119.2	18036.8	17377.0	16050.2	14195.7	14114.2	12179.9	9655.0	8560.7	7825.9	10235.6	15865.7	19119.2
1929-30	12133.7	10496.9	9070.5	8297.6	7825.9	10235.6	15854.7	.
1930-31	13277.9	11545.0	9655.0	8560.7	7825.9	10235.6	15825.3	.
1931-32	7152.4	5394.0	3120.9	2505.8	2508.3	5981.0	14098.3	.
1932-33	6898.4	5243.1	2978.5	2316.4	2828.5	5713.3	13243.9	.
1933-34	5583.1	3401.0	1082.4	515.3	1501.5	8686.1	15431.2	.
1934-35	8392.3	6310.0	5459.8	5181.2	4978.8	7599.1	14333.9	.
1935-36	7901.3	5846.8	4794.8	4273.0	4713.4	7997.7	15762.2	.
1936-37	13784.9	12112.6	9655.0	8560.7	7825.9	10235.6	15803.1	.
1937-38	8004.3	6305.4	4732.0	4711.7	5361.0	7999.2	14962.9	.
1938-39	11947.2	9755.8	7933.1	7252.0	7141.6	10160.0	15865.7	.
1939-40	11316.7	9435.1	8127.6	7637.1	7592.8	10165.1	15852.0	.
1940-41	14114.2	11962.2	9509.0	8458.4	7784.6	10196.9	15749.0	.
1941-42	11133.3	9272.6	6745.3	5820.2	5613.7	8531.5	15851.5	.
1942-43	10052.8	9293.4	6766.1	5965.8	6083.0	7150.4	13308.0	.
1943-44	14114.2	12179.9	9655.0	8560.7	7825.9	10235.6	15865.7	.
1944-45	12909.2	10557.6	8529.1	7490.3	7177.1	9595.3	15685.9	.
1945-46	6390.5	4615.5	2303.7	1617.4	2048.8	5504.4	14433.2	.
1946-47	6681.2	5037.5	2988.5	2938.1	3835.5	7230.4	14838.9	.
1947-48	6644.5	4945.1	2697.4	2264.3	2831.2	5997.8	14391.1	.
1948-49	10498.1	8626.7	6943.7	6198.7	6276.5	9902.9	15865.7	.
1949-50	7591.3	5786.0	3460.5	2960.6	3563.7	6094.0	12133.4	.
1950-51	7404.4	5730.7	4002.4	3810.6	4651.2	6724.2	15134.2	.
1951-52	8637.0	6781.7	4956.1	4697.7	5220.3	7530.9	14093.6	.
1952-53	9322.0	7428.9	6489.9	5539.3	5384.5	7104.9	14703.3	.
1953-54	6337.4	4632.6	2396.2	1742.7	1786.3	4628.2	11181.5	.
1954-55	8278.6	6607.3	4380.1	4228.5	4890.8	7218.7	13283.8	.
1955-56	7091.2	5382.5	3075.9	2395.5	2706.4	6419.1	14529.6	.
1956-57	7621.4	5874.0	3624.4	2924.7	3412.3	6373.1	15797.7	.
1957-58	7096.9	5402.1	3147.1	2509.5	2943.0	6032.6	14852.8	.

Note: The above ORC's are limited to individual project flood control rule curves. Prior AOP's did not include the flood control limit in the Table 10 list of ORC's although it has always been limited in the hydroregulation model.

TABLE 11M
(Metric Units)
COMPARISON OF
RECENT ASSURED OPERATING PLAN STUDIES

	1996-97	1997-98	1998-99	1999-00	2000-01
MICA TARGET OPERATION					
(hm ³ [xxxx.x] or m ³ /s [xxxx.xx])					
AUG 15	8455.9	8455.9	8455.9	8455.9	8529.3
AUG 31	FULL	FULL	FULL	FULL	FULL
SEP	FULL	FULL	FULL	FULL	FULL
OCT	396.44	424.75	311.49	8387.4	8284.7
NOV	538.02	538.02	7966.6	7770.9	7477.3
DEC	651.29	651.29	6547.6	679.60	707.92
JAN	679.60	679.60	679.60	707.92	736.24
FEB	566.34	622.97	622.97	622.97	651.29
MAR	538.02	538.02	622.97	594.65	622.97
APR 15	382.2	259.8	210.9	382.2	736.24
APR 30	0.0	0.0	137.5	259.8	259.8
MAY	283.17	283.17	283.17	283.17	226.53
JUN	283.17	283.17	283.17	283.17	226.53
JUL	8211.3	8211.3	8333.6	8455.9	8455.9
COMPOSITE CRC1 CANADIAN TREATY STORAGE CONTENT (hm³)					
1928 AUG 31	19119.2	19119.2	19119.2	19119.2	19119.2
1928 DEC	12554.0	14082.1	15293.5	13746.0	13218.2
1929 APR15	294.3	1660.5	4101.2	4313.6	3909.4
1929 JUL	16602.6	16792.0	17140.4	16920.7	17410.3
COMPOSITE 50-YR AVERAGE CANADIAN TREATY STORAGE CONTENT (hm³)					
AUG 31	18000.4	17645.1	17918.4	17848.9	18079.9
DEC	11729.2	12782.8	13662.5	12925.6	12619.1
APR15	1597.6	1785.3	2174.0	3484.0	2815.3
JUL	17424.4	17414.7	17397.0	17369.1	17795.8
STEP I GAINS AND LOSSES DUE TO REOPERATION (MW)					
U.S. Firm Energy	-2.0	-0.9	-5.1	-1.5	-0.3
U.S. Dependable Peaking Capacity	3.0	-4.0	27.0	0.0	-2.0
U.S. Average Annual Usable Secondary Energy	1.2	13.9	18.9	19.5	16.2
BCH Firm Energy	36.0	46.7	26.7	102.2	60.8
BCH Dependable Peaking Capacity	-10.0	19.0	18.0	-3.0	-36.0
BCH Average Annual Usable Secondary Energy	-36.9	-43.5	-18.5	-42.9	-43.6
COORDINATED HYDRO MODEL LOAD (MW)					
AUG 15	10047	10223	10083	9793	10043
AUG 31	10055	10259	10203	9925	10125
SEP	10028	10121	9957	9630	10095
OCT	10508	10153	9963	9764	10046
NOV	11716	11452	11305	11297	11381
DEC	12738	12582	12787	12766	12836
JAN	13340	13477	13640	13725	13484
FEB	12581	12664	12638	12674	12765
MAR	12277	11948	11994	12113	11807
APR 15	13045	12843	11671	11099	11332
APR 30	14550	13437	12425	12672	13025
MAY	15720	16270	15701	17263	14347
JUN	11426	13781	14662	14699	11925
JUL	10559	10366	10594	9894	11275
ANNUAL AVERAGE	12061	12171	12117	12131	11850

Appendix A1
(English Units)
Project Operating Procedures
1997-98 & 2000-01 Assured Operating Plan and Determination of Downstream Power Benefits

Definition of split months:

Apr (April 1-30); Apr 15 (April 1-April 15); Apr30 (April 15-April 30); Aug (August 1-31); Aug 15 (August 1-15); Aug 31 (August 16-31).

<u>Project</u>	<u>Constraint</u>	<u>Requirement 1997-98</u>	<u>Requirement 2000-01</u>
<u>Hungry Horse</u> <u>(1530)</u>	Minimum Flow	3500 cfs at Columbia Falls all months 145 cfs minimum project discharge	No change
	Maximum Flow	4500 cfs at Columbia Falls Oct 15 - Dec 15 6800 cfs June, July, and Aug for fishing	No change
	Minimum Content	1930: 1160.4 ksfd Jul, 313.4 ksfd Dec 1930: Jan-Jun (ksfd) as follows: 239.4 / 193.8 / 111.7 / 135.2 / 258.3 / 394.8 / 582.6 1931: 655.8 ksfd Jul, 239.4 ksfd Dec 1931: Jan-Jun (ksfd) as follows: 193.8 / 151.0 / 69.0 / 69.0 / 69.0 / 423.6 / 516.3 1932: 366.9 ksfd Jul	No change
	Other	85 ft draft limit for resident fish implemented as minimum VECC limit of 694.4 ksfd	No change
<u>Kerr</u> <u>(1510)</u>	Minimum Flow	3200 cfs all periods	4000 cfs Dec-Feb 12000 cfs May 16-Jun 15 (monthly ave used was 7742 cfs May and 7600 cfs June) 3200 cfs all other periods
	Maximum Flow		20000 cfs Aug, Sep, and Apr 15000 cfs Oct, Nov, Mar 18000 cfs Dec, Jan, Feb 40000 cfs May - Jun 30000 cfs July
	Minimum Content	614.7 ksfd Jun-Sep 426.3 ksfd May Empty Apr 15	No change
	Other	Conditions permitting, should be on or about 2883 ft (empty) Apr 15	No change